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PATENT SPECIFICATION

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Complete Accepted: March 10, 1932.

COMPLETE SPECIFICATION.

Improvements in Method of Manufacturing Guide Blade Devices for Steam or Gas Turbines.

I, HAROLD GEORGE CRUIKSHANK FAIRWEATHER, of 65—66, Chancery Lane, London, W.C.2, and 29, Saint Vincent Place, Glasgow, of British Nationality, do hereby declare the nature of this invention (a communication from Allmanna Svenska Elektriska Aktiebolaget, of Västeras, Sweden, a company organised under the laws of Sweden), and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

In the manufacture of guide blade devices for steam or gas turbines for axial admission of the driving medium several methods have been used. According to one method guide wheels are each formed as a single piece or in two halves by a casting operation. This method suffers from several drawbacks, both in the casting operation itself and in the finishing work of the guide blades. In order to overcome these drawbacks proposals have been made to cast the rim of the guide wheel in small pieces, each comprising one or more blades with the associated end portions bounding the driving medium channel in radial direction, and attach these pieces to integral supporting rings. In the starting of a turbine provided with such guide wheels said pieces will be heated and the length thereof increased due to said heating, while the supporting rings are still in cold state. Consequently the expansion of the pieces must take place inwardly. This may cause, especially in connection with radial flow turbines of the double rotation type having axial expansion stages, the risk of touching, provided the radial clearances are not sufficiently large.

Another well-known method involves manufacturing each blade of the guide blade rim individually and then attaching the blades to two supporting rings by a welding operation. This may be carried out, for instance, by providing an annular band of large cross section with an axially projecting, sleeve-shaped projection, as by a turning operation, said projection being of a comparatively small thickness. In these projections there are then formed apertures corresponding to the section of the blades. The blades are then introduced into said apertures the blade ends projecting somewhat beyond the band being then caused by a welding operation to melt together with the welding material so as to form a strong welded guide blade rim together with the said annular band of large cross section. The same method is applied in case of both blade ends. This method, however, suffers from the drawback that it may give rise to heavy internal stresses which may sometimes be so great as to cause one blade or more to completely break down.

This invention relates to a method of manufacturing guide blade wheels whereby the above said drawbacks will be overcome and the manufacture will at the same time be more simple and cheap than heretofore.

The invention is characterised, substantially in that plate metal bands are bent into annular shape and are then inserted in annular carriers which are thereupon placed concentrically with respect to each other, the blades being then introduced with their ends in corresponding apertures formed in the sheet metal rings thus centered and are attached to said rings by a welding operation in such a way as to produce a mass of a welding material outside of each band, said welded mass being then subjected to a turning operation in order to obtain a dove-tail profile and the bands finally cut from the carriers.

The invention is illustrated in the accompanying drawings. Fig. 1 shows a band having apertures formed therein to receive the blade ends. Fig. 2 is a cross section of the band inserted in a carrier ring. Fig. 3 is a cross section of two bands of one and the same guide blade ring with the carrier rings and a guide blade in position for welding. Fig. 4 is a cross section of two bands with a blade inserted therebetween after completion of the welding operation, and Fig. 5 is a cross section of a finished guide blade disc.

Fig. 6 illustrates a modified form of the blade root and Fig. 7 shows a modified form of the blade top.

In manufacturing a guide blade wheel according to this invention bands 1 of

[Price 1/-]

suitable material and cross section are bent around a pair of rollers or the like so as to be converted into annular shape. In the embodiment shown, the guide blade wheel comprises, for instance, an outer band of conical annular shape and an inner band of cylindrical annular shape. Each band is introduced with its one edge into a corresponding annular groove 3 formed in an annular carrier member 2, the band being then attached to said carrier member by tack welding 4. In this way a pair of carrier rings 2 having sleeve-shaped projections 1 will result which will be cheaper in manufacture than a wheel in which the band and the carrier members are formed integrally, as previously practised. In the bands 1 apertures 5 are formed to receive the blade ends. The rings 2 with the associated bands which should form part of one and the same guide blade wheel are then placed concentrically upon a table or plate for fixing work and the guide blades 6 inserted in their place with the ends projecting through the apertures 5 of the bands. At one end the blade is preferably formed with an offset, as shown in Fig. 3, in order thereby to fix the position of the blade with relation to the band. After all blades have been inserted in place, the guide blade wheel is ready for welding. If desired only one of the sheet metal bands 1 is attached to the carrier ring 2, the other band 1 remaining free during the welding of the blades thereto. In the welding operation the blades are first attached to the bands by tack welding. This welding operation is then repeated, until a mass of welding material 9, Fig. 4, has collected outside of each band so as to extend around the entire periphery of the band. The table or plate with the disc is then fixed in a turning lathe and dove-tailing or some other suitable profile is turned in the mass outside of each band, as indicated by dotted lines in Fig. 4. The bands are then cut away from the fixing members, as indicated by the arrow in Fig. 4.

The guide blade wheel is now ready for mounting. In order to strengthen the guide blade wheel two ring halves 10, 11 and 12, 13, respectively, Fig. 5, of a profile corresponding to that of the dove-tailed ends are clamped by means of screws or rivets about each dove-tailed end. Said ring halves are preferably formed with recesses 16 in order that in the assembling of the ring halves a positive clamping of the dove-tailed ends may be secured. By means of bolts 14 the guide blade wheel thus obtained may be attached to the turbine casing or to parts associated therewith. If desired, the guide blade wheel may be formed in two halves.

In Fig. 6 a modified form of the outer end 7 of the blade is shown, and in Fig. 7 a modified form of the inner end of the blade is shown. The said last-mentioned end is shown as provided with a projecting sealing edge 15.

The carrier rings used in the manufacture above described may be again utilised after the bands have been cut away therefrom and the remaining parts of the bands have been removed from the grooves, the costs of manufacture being thereby considerably reduced. Other advantages involve that the welding masses will be small and internal stresses due to the welding will be practically eliminated. Furthermore, the deformations will be small and no shrinking troubles will be met with.

Of course, the method may be modified in respect of its details without departing from the scope or principle of the invention as pointed out in the following claims.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. A method of manufacturing guide blade wheels for axial flow turbines, characterised in bending sheet metal bands to annular shape, inserting said annular bands into annular carrier members, placing said carrier members concentrically in respect to each other, inserting the blades with their ends in suitable apertures in the sheet metal rings thus centered and attaching the blades to said rings by a welding operation in such a way as to form a mass of welding material outside of each band, subjecting said masses to a turning operation to form a dove-tailed or other profile adapted to facilitate the mounting of the guide blade wheel, and cutting the bands away from the carrier members.

2. A method as claimed in claim 1, characterised in this that the sheet metal bands after having been bent to annular shape are inserted with one edge in corresponding annular grooves formed in the centered carrier rings and are attached to said rings by tack welding or the like.

3. A method as claimed in claim 1, characterised in this. that one of the sheet metal bands only is attached to the respective carrier ring, whereas the other band remains completely free in the welding of the blades thereto.

Dated this 15th day of May, 1931.

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and
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Agents for the Applicant.

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[This Drawing is a reproduction of the Original on a reduced scale.]

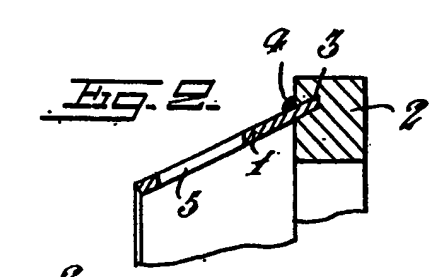

Fig. 2.

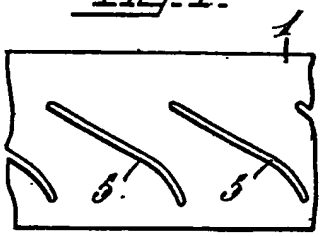

Fig. 1.

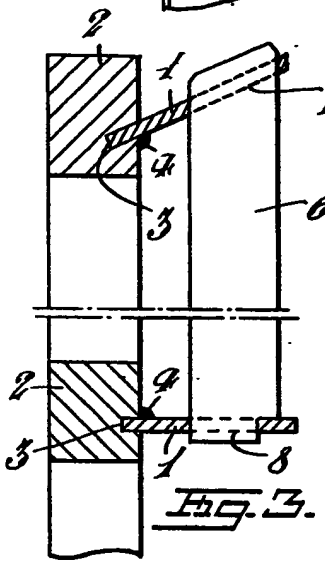

Fig. 3.

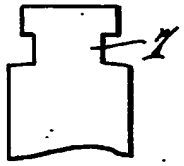

Fig. 6.

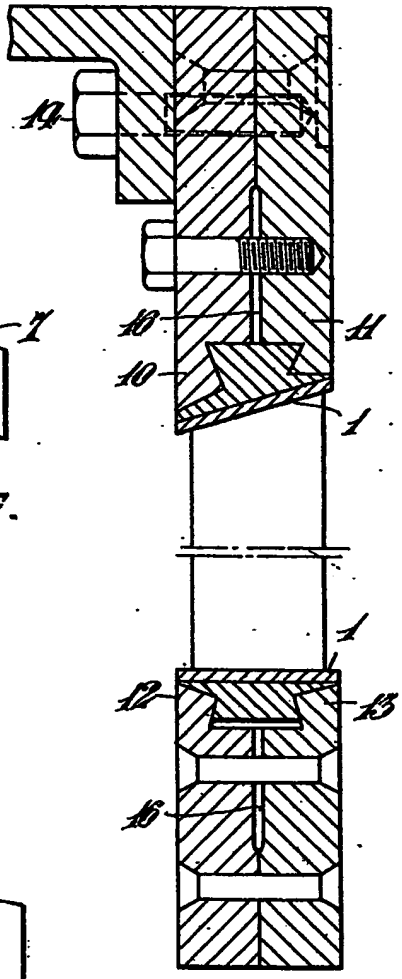

Fig. 5.

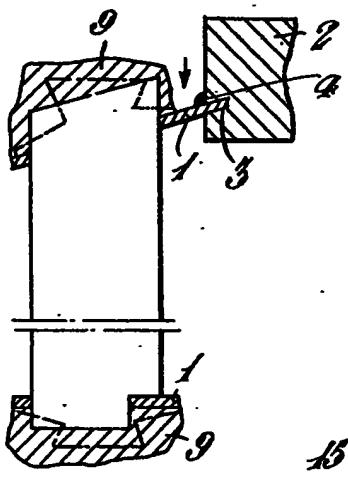

Fig. 4.

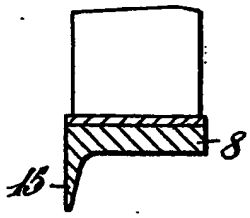

Fig. 7.

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